

New Pogonophora from the Eastern Pacific Ocean

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CONTINUING SURVEYS, since 1955, of faunas in offshore areas of southern California, conducted by the Allan Hancock Foundation, using the facilities of the M/V "Velero IV," have resulted in finds of several representatives of pogonophorans. One, belonging to the genus *Siboglinum* Caullery, is believed to represent an undescribed species. Other kinds, from different places, are briefly reported below, to indicate the wide range of occurrences in deep ocean bottoms off southern California. All come from depths exceeding 950 m. and in latitudes south of 33° N. The much larger and far better explored shallower depths have yielded none, despite the examination of thousands of grab samples from shelf, slope, basin, and canyon depths of the shelf lands between Point Conception, California, to south of the Mexican border.

All specimens are deposited in the collections of the Allan Hancock Foundation. I am indebted to the Administration of the Foundation for permission and time to study these interesting materials. The cost of collecting the materials was defrayed by funds from the National Science Foundation and the Allan Hancock Foundation. Captain G. Allan Hancock has generously provided for any deficiencies in the running costs of the ship. The scientific and operating crews of the "Velero IV" took and processed the collections. Dr. Gösta Jägersten, Uppsala, Sweden, examined specimens and verified their generic affinities. The illustrations were prepared by Anker Petersen. I am indebted to all of these people for their help and interest.

GENUS *Siboglinum* Caullery, 1914

TYPE *S. weberi* Caullery, 1944

Siboglinum veleronis, new species

Figs. 1-9

COLLECTION: More than 100 specimens were taken by the "Velero IV," sta. 7049, May 7, 1960,

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14.85 mi. 264° true from Point La Jolla, 32° 49' 37" N., 117° 35' 12" W., in 976 m., from the axis of La Jolla canyon near its convergence with the San Diego trench. The Campbell grab, weighing about 900 lb. with a capacity of about 5 cu. ft., recovered 2.51 cu. ft. of gray sand and green mud. In addition to the *Siboglinum* specimens, the sample yielded the kinds and numbers of animals listed below.

DIAGNOSIS: Individual tubes measure 50-65 mm. long by 0.13 mm. across. Others are longer or narrower, having a length-to-width ratio of 450-720 to 1. Each tube is usually slender, cylindrical, pale to dark straw-colored, and crossed by alternating dark brown and pale bands. The brown ones are typically paired (Fig. 2), so that both of a pair are nearly twice as long as one pale band. An occasional irregularity in this pattern results when the two dark ones are so close together as to appear fused, or are incomplete on one side to form a broader than usual, incomplete, pale band. The greater length of the tube is crossed by these alternating cross bars; only the distal anterior and posterior ends (Fig. 1) are pale and usually collapsed. The animal within lies usually some distance within the banded region; none has been found partly or wholly out of the tube. With the aid of a stereoscopic microscope the specimen can be seen through the wall of the tube and oriented with respect to the anterior and posterior regions, the tentacle in front directed forward, and the annular or uncinial band marking the approximate middle region of the body. However, dissection is necessary to study the animal more completely. Slitting the tube lengthwise has been found least destructive to the soft-bodied specimen; by using a razor-sharp, finely pointed knife and inserting it into the distal end of the tube, then extending the cut lengthwise for the length of the contained individual, one can then lift it out intact from the shell of the tube.

An entire animal measures 15 mm. long to the annular, or uncinial, region which is near the middle, making the total length about 30

mm. The body is nearly uniform in width but is widest in the mesosomal region where it measures 0.065 mm.; the postannular region gradually becomes slenderer and tapers posteriorly. The tentacle is less than half as wide as the body and extends forward for a length nearly two and a half times that of the mesosomal length. Its insertion marks the ventral side of the body as herein interpreted, as well as the posterior end of the first body region or protosoma. The three body regions are not sharply separated from one another. The separation between the first and second regions is behind the tentacular insertion and is vaguely indicated by a faint line extending obliquely forward around the body to the middorsum. The second region, or mesosoma, is about four times longer and is separated from the third region, or metasoma, by a transverse groove located just in front of the paired glandular papillae (see Figs. 5, 6). The third region is much the longest and comprises most of the length of the body.

The tentacle is extended forward nearly straight in some specimens and is loosely to closely coiled in others, or only a short distal end is coiled. Most of the length has lateral, filiform branches or pinnules, inserted in two nearly regular rows along the ventrolateral edge (Fig. 4); those nearer the distal end are more dispersed, whereas those nearer the base (Fig. 3) are closer together and tend to be curled toward the mid-ventral line. Each pinnule is very slender and longer than the tentacle is thick. These features agree with those described for other species of the genus having pinnules; only two (*S. inermis* Ivanov and *S. atlanticum* Southward and Southward) are said to lack them.

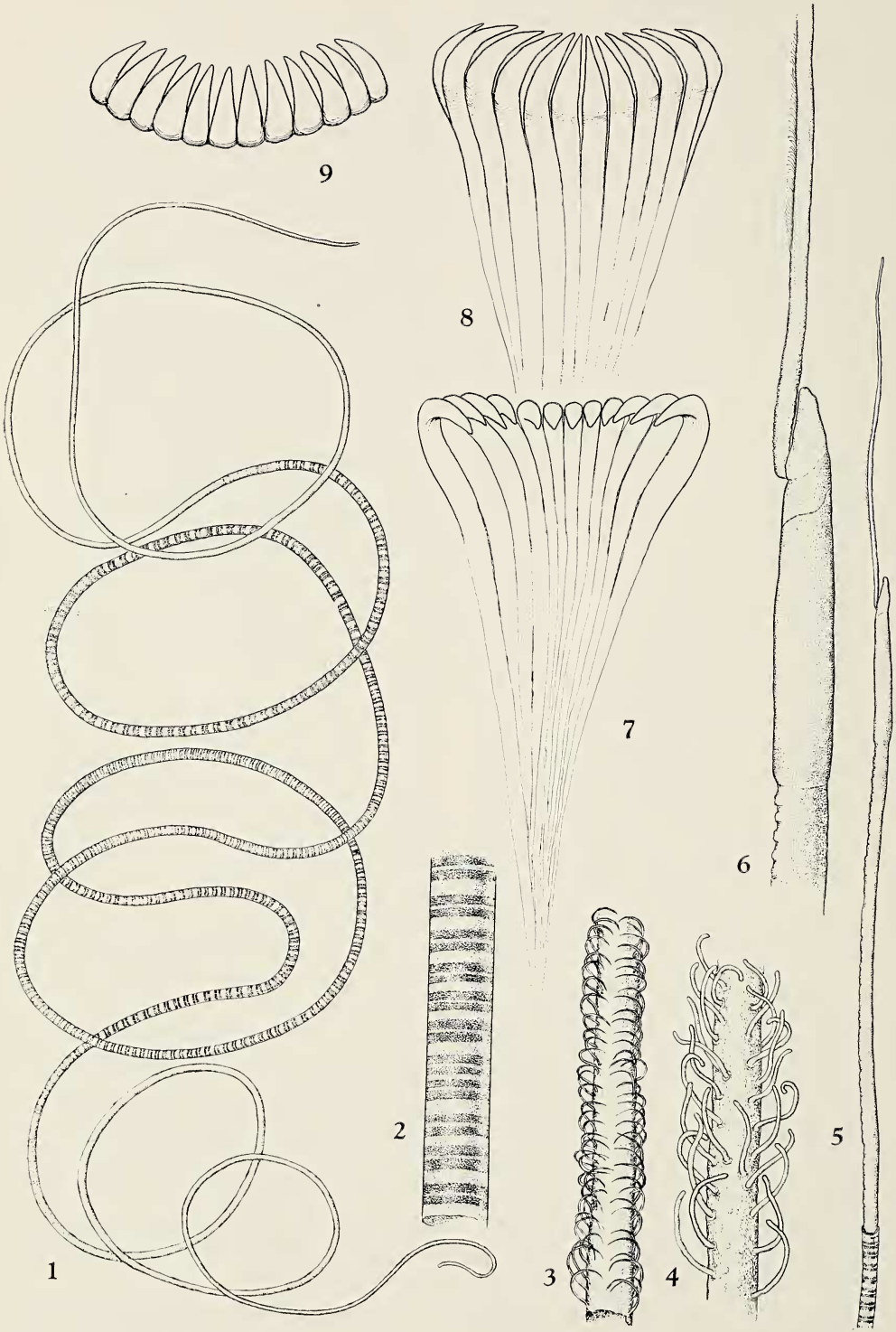
The protosoma or anteriormost region of the body is short, subconical, tapers forward, and lacks markings; its posterior end is indicated on the ventral side of the body by the insertion of the tentacle. This fusion is firm, so that the two are not easily severed. A mouth, if present, would be expected at the posterior base of this tentacle, for which the principal function seems to be that of food gathering. I have seen no oral aperture or any indication of an alimentary tube but would not exclude the possibility of a lengthwise transport tube of some kind in an animal of such great length.

The second body region, the mesosoma, is considerably longer than the first and is cylindrical in shape; near its anterior end it is obliquely crossed by the bridle or frenulum (Ivanov) or girdle (some other authors). It is separated from the third region, or metasoma, by a transverse groove. A pair of circular pores is located at the sides, just behind the frenulum (Fig. 6); they are believed to be the external apertures of the coelomoducts for the second segment.

The anterior end of the metasoma is characterized by the presence of ventrolateral paired glandular papillae; they are so arranged that the two members of a pair are separated from successive ones by a space about equal to that of the distance between the brown bars on the tube. It thus seems obvious that these papillar glands are directly concerned with tube secretion. This region is followed by the much longer goniadial region, characterized by sparsely and irregularly dispersed epithelial papillae. About halfway along the length of the body two transverse series of uncinial rows indicate the position of the annular region; for this reason the goniadial region in front is called the preannular, and the same one behind is the postannular, region.

The annulae are of particular interest because they bear hard, chitinized platelets, or uncini, in transverse series. Those of the anterior row are incomplete and number about 38, while those in the posterior row are more numerous, numbering about 44. All uncini are of one kind, and terminate distally in a single row of denticles (Fig. 8), numbering 9–13. Each uncinus is distally recurved so that those of successive uncini tend to overlap. Seen from the end the denticles form an arcuate row (Fig. 9). The basal or embedded stems are not chitinized but taper rapidly to very tenuous strands, and are so prolonged that all those of one transverse series are brought together as a fascicle and carried obliquely forward to attach to the body wall. They may function to anchor the animal within the tube at selected places. The comparable uncini in some other species, *S. atlanticum* and *S. inermis*, have been shown as having multiple rows of crenulations (see Southward and Southward, 1958: 629, 631).

S. veleronis was recovered from a quantitative sample covering a surface area less than a half



a square meter. The animals contained in the mud, without tubes, weighed about 6.4 g. (moist weight). They included the following:

Siliceous sponge spicules, scattered through the debris

Anemone, small white, 1

Crustaceans (not identified)

ostracod, 1; amphipod, 1; cumacean, 2; gnathid isopod, 2

Mollusks: more than 100 living small gastropods, pelecypods, and 3 small solenogasters (not identified)

Echinoderms, identified by Fred Ziesenhenn

Ophiacantha normani Lyman, 2

Ophiura kofoidi J. F. McClendon, 22

Polychaetes: with 22 species and more than 200 specimens

Ancistrosyllis tentaculata Treadwell, 3

Axiobella sp., 6

Aricidea aciculata Hartman, 3

A. uschakowi Zachs, 32

ampharetid, juveniles, 4

Brada glabra Hartman, 12

Chaetozone ?gracilis (Moore), 2

Chaetozone sp., fragments, 2

Cossura candida Hartman, juveniles, 2

Glycera ?capitata Oersted, juveniles, 2

Haploscoloplos elongatus (Johnson), 4

Heteromastus ?filobrancheus Berkeley, 4

Maldane cristata Treadwell, 13 (the largest and most conspicuous in the sample, contained in thick, mudwalled tubes with lateral vents and branches)

Myriochele ?gracilis Hartman, juvenile, 1

Ninoe fusca Moore, 12

Notbria sp., juvenile, 1

Paraonis gracilis oculata Hartman, 77 +

Pilargis hamata Hartman, 1

sabellid tube, 1

Terebellides sp., juvenile, 1

Tharyx monilaris Hartman, 10 +

T. tessellata Hartman, 4

Pogonophora

Siboglinum veleronis, new species, 100 +

The total number of species and specimens is thus 30 + and 428 +.

SYSTEMATIC AFFINITIES: *S. veleronis*, the eleventh species to be described in the genus *Siboglinum*, differs from others in that the tube has double bands of dark brown bars, and the uncini of the annular region have 9–13 teeth in a single transverse row. The proportional lengths of the first and second body regions, shown in Figures 5 and 6, differ from those of other species.

It is noteworthy that all but two of the known species occur in far northern latitudes. Six come from the northwestern end of the Pacific Ocean; three others are from the northeastern part of the Atlantic. The first species of the genus, *S. weberi* Caullery, came from the Malay trench in great depths, and the present species is the first to be described from the western hemisphere. These species, with their distributions are as follows:

S. weberi Caullery, 1944, IndoPacific area, in 462–2060 m., in fine sand and mud.

S. ekmani Jägersten, 1956, Skagerack, northwestern Europe, in 487–650 m., clay.

S. caulleryi Ivanov, 1957, Ochotsk Sea, in 90–200 m., and other northwestern Pacific areas in depths of 23–8100 m., in the Kurile trench.

S. cinctulum Ivanov, 1957, northwest Pacific, in 3420 m., in the Kurile trench.

S. pellucidum Ivanov, 1957, southwestern part of the Bering Sea in 1740–4820 m.

S. minutum Ivanov, 1957, Bering Sea in 3740–3840 m., and Kurile-Kamchatka trench in 5540 m.

S. fedotovi Ivanov, 1957, southwestern part of the Bering Sea in 3330–3940 m.

S. plumosum Ivanov, 1957, Ochotsk Sea east of Japan, in 124–318 m.

FIGS. 1–9: *Siboglinum veleronis*, new species, from "Velero IV" sta. 7049. 1, Entire tube containing animal, $\times 22$; 2, part of tube showing paired dark alternating with pale bands, $\times 89$; 3, part of tentacle from near base, showing pinnules curled toward midventrum, $\times 228$; 4, another part of tentacle from another individual, with pinnules nearer tip of tentacle, $\times 228$; 5, animal with tube partly dissected away, tentacle directed forward, in left lateral view, $\times 25.5$; 6, enlarged anterior regions including protosoma, mesosoma with frenulum and pore of coelomoduct, and part of glandular metasoma, in left lateral view, $\times 83$; 7, an uncinus from annular zone, seen from denticled side, $\times 5,720$; 8, an uncinus seen from opposite side, $\times 5,720$; 9, an uncinus seen from top, showing arcuate arrangement of denticles, $\times 5,720$.

S. atlanticum Southward and Southward, 1958, from the northeastern Atlantic, in 600–1400 m.

S. inermis Southward and Southward, 1958, from the same locality as the preceding.

S. veleronis, n. sp., from La Jolla canyon, southern California, in 976 m.

In addition to *S. veleronis*, the collections of the Allan Hancock Foundation contain representatives of three other pogonophores. One is mentioned earlier (Hartman and Barnard, 1960: 283) coming from West Cortes, East Cortes, and Long basins and from the San Diego trench. The collar segments of the tube measure 2.9 mm. across and 3.3 mm. long; each is drab dark brown, cylindrical, paler at one end where it flares and is frayed. In size and shape they most nearly resemble those shown for *Galathealinum* (Kirkegaard, 1956: 81).

Another kind, a *Siboglinum* sp., has just been received from a trawl station, "Velero IV," sta. 7231, off San Eugenio Pt., Lower California, Mexico, in 4800 m. This organism inhabits tubes which, in size and color, resemble those of *S. veleronis*, but the alternating brown bands are single, not double, and range from four to six times as long as the pale ones, or only a little longer. The protostoma has a pair of small red eyespots at the sides—the first known instance of eyes in pogonophores. The ventral side of the tentacle appears villous, due to paired rows of long, closely set pinnules. The uncini are in two transverse, single rows and are set far apart, the distance being about equal to four times that of the body width.

A fourth species is *S. ekmani* Jägersten, from the Skagerack, Denmark, a gift from the Zoological Museum at Copenhagen.

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